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EXAMINER	
FINK, BRIEANN R	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/586,781	Applicant(s) JACOBSEN ET AL.	
	Examiner Brieann R. Fink	Art Unit 1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _11 January 2010_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _12-22_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _12-22_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. This office action follows a reply filed on January 11, 2010. Claims 12 has been amended. Claims 12-22 are currently pending and under examination.

2. The rejection of claim 12 under 35 U.S.C. 112, second paragraph, as being indefinite is withdrawn.

3. The remaining rejections, as set forth in the previous office action, are deemed proper and are therefore maintained.

4. The texts of those sections of Title 35 U.S. Code are not included in this section and can be found in a prior Office action.

Claim Rejections - 35 USC § 103

5. Claims 12-19 rejected under 35 U.S.C. 103(a) as being unpatentable over *Murray* (US 2003/0171206), in view of *Jenkins III et al.* (US 4,588,790 or 4,543,399).

Murray teaches single-site, imino-amide catalyst precursors and catalysts useful for the polymerization of olefins, like ethylene, and higher alpha-olefins (p. 1, [0001] and [0029]). The catalysts may contain a metallocene complex (p. 3-4, [0054]. Gas phase polymerization is preferred using one or more olefins, one of which is ethylene (p. 10, [0114]). *Murray* discloses that a preferable polymerizable combination is that of ethylene with an α-olefin comonomer having 4 to 12 carbons (p. 10, [0117]). A typical gas phase polymerization process used for this polymerization is a continuous, fluidized bed process (p. 10, [0121]).

Murray fails to explicitly teach that the gas phase polymerization is operated in “condensed mode”, as required by instant claim 12, which is defined by the applicant to be defined as “...the process of purposefully introducing a recycle stream having a liquid and a gas phase into the reactor ..." (see instant specification, p. 2, ll. 23-31). Although *Murray* fails to explicitly teach operating the reactor in condensed mode, *Murray* does teach a recycle stream being withdrawn from the fluidized bed and recycled back into the reactor, citing *Jenkins et al. III* as a few examples of this recycle stream.

Jenkins et al. III (‘399) teaches polymer production in a fluidized bed reactor employing an exothermic polymerization reaction by cooling the recycle stream to below its dew point and returning the resultant *two-phase* fluid stream to the reactor to maintain the reaction at a desired temperature above the dew point of the recycle stream (Abstract). *Jenkins et al. III* (US ‘790) teaches withdrawing from the reaction zone a stream comprising unreacted gases, cooling the stream and recycling the cooled stream to the reaction zone together with sufficient additional monomer, where at least a part of the recycle stream is cooled to condense a portion thereof and form a *liquid-containing mixture* (Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have operated the gas phase polymerization of *Murray* in "condensed mode" as required by the instant invention, as *Murray*

clearly suggests this method of polymerization through the incorporation of the *Jenkins et al. III* references.

As to claims 14-17, *Murray* teaches the copolymerization of ethylene with an α-olefin comonomer having 4 to 12 carbons, specifically listing octane-1 and decene-1 as comonomers, and that of which are copolymerized in a mole ratio of comonomer to ethylene of 0.001 to 0.200, preferably 0.002 to 0.008 (p. 10, [0115] and [0117]). This ratio is equivalent to the partial pressure ratio of comonomer to ethylene, which can be shown when applied to the ideal gas law (pV = nRT). This range overlaps the claimed range of claims 15 and 17, and it has been held that overlapping ranges are sufficient to establish *prima facie* obviousness. See MPEP 2144.05.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected from the overlapping portion of the range taught by the reference because overlapping ranges have been held to establish *prima facie* obviousness.

As to claim 13, *Murray* teaches the mole ratio of comonomer to ethylene, as well as the reactor pressure; therefore, assuming that there are no other gases present in the reactor, the partial pressure of ethylene can be obtained as follows:

The lower limit of the mole ratio of comonomer to ethylene is 0.002. The mole ratio of comonomer to ethylene can also be expressed as 0.002 moles of comonomer to 1 mole of ethylene; therefore, for every 1 mole of ethylene, there

are 1 plus 0.002 moles of comonomer and ethylene. 1 mole of ethylene to 1.002 moles of comonomer and ethylene is equivalent to the mole fraction of ethylene in the mixture of comonomer and ethylene (x_{Et}). The mole fraction of ethylene in the mixture of comonomer and ethylene (x_{Et}) and the pressure in the reactor (P) can be used to calculate the partial pressure of ethylene in the reactor (P_{Et}) as shown in the following equation: $P_{Et} = x_{Et} \cdot P$. The pressure in the reactor (P) is taught by *Murray* as being preferably between 1.379 MPa and 2.759 MPa (p. 11, [0122]). Using the lower limit of the pressure in the reactor, 1.379 MPa, the partial pressure of ethylene is 1.721 MPa ($P_{Et} = 1\ mol_{Et} / 1.002\ mol_{Comonomer + Et} \cdot 1.724$ MPa). Using the same calculation with the upper limits of the mole ratio of comonomer and ethylene and the pressure in the reactor, the partial pressure of ethylene is 2.395 MPa ($P_{Et} = 1\ mol_{Et} / 1.008\ mol_{Comonomer + Et} \cdot 2.414$ MPa). The range calculated from *Murray* of the partial pressure of ethylene is around 1.721 MPa to 2.395 MPa. This range overlaps the claimed range of claim 13, and it has been held that overlapping ranges are sufficient to establish *prima facie* obviousness. See MPEP 2144.05.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected from the overlapping portion of the range taught by the reference because overlapping ranges have been held to establish *prima facie* obviousness.

Note: *Murray* fails to specifically teach that the amount of α-olefin is maintained below that at which “substantial condensation” in the reactor occurs;

however, the amount of comonomer and temperature and partial pressures in the reaction zone are clearly taught by *Murray* and would have been obvious to one of ordinary skill in the art at the time the invention was made to have operated the polymerization in "condensed mode", as described above. Therefore, the process of *Murray* in view of *Jenkins et al. III* would have inherently been void of any "substantial condensation", as required by the instant claim 12. This is further supported by the applicants' disclosure that "the level of condensation in the reactor…is controlled by the amount of comonomer and the temperature and partial pressure in the reaction zone" (see arguments submitted May 26, 2009, page. 8).

6. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Murray* (US 2003/0171206) in view of *Jenkins III et al.* (US 4,588,790 or 4,543,399), as applied to claim 17 above, and further in view of *Muhle et al.* (US 6,180,736).

Murray in view of *Jenkins III et al.* is *prima facie* obvious over instant claim 17, as noted above, as the ratios taught by *Murray* clearly overlap that of the instant invention. With respect to the lower part of the range claimed by the instant invention, *Murray* fails to suggest this low of a comonomer to ethylene ratio.

Muhle et al. discloses a gas-phase polymerization process used to polymerize ethylene and one or more comonomers with metallocene catalysts (col. 3, ll. 14-17). *Muhle et al.* teaches that a highly incorporating catalyst can

produce low density polyethylene with a low ratio of alpha-olefin/ethylene reactants (col. 2, ll. 52-54). *Muhle et al.* further teaches that a higher concentration of alpha-olefin produces a higher concentration of dissolved alpha-olefin in the polymer particles, therefore causing agglomeration which slows the polymerization process (col. 2, ll. 55-58).

It is known in the art that higher alpha-olefins have higher boiling points, such that 1-decene has a greater boiling point than 1-octene. Being that the polymerizations are run in the condensed mode, the higher alpha-olefin is typically introduced into the fluidized bed reactor as a liquid through the recycle stream, which is then turned into a gas. Further, more energy is required to vaporize the same amount of 1-decene than 1-octene. Therefore, if a large amount of 1-octene is incorporated into the reactor, a large concentration of dissolved 1-octene will be present, which as taught by *Muhle et al.* creates a great amount of agglomeration. On the other hand, if the same large amount of 1-decene is incorporated into the reactor, an even greater amount of dissolved 1-decene will be present than 1-octene, creating even more agglomeration. As shown, there is a reverse correlation between the number of carbons in the higher alpha-olefin and the amount that should be present in the reaction, such that the more carbons in the carbon chain, the lower the concentration in the reaction.

Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have modified the polymerization of *Murray et al.* as

suggested by *Muhle et al.* by minimizing the higher alpha-olefin content to reduce agglomeration and therefore allow for greater production rates.

7. Claims 19-20, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Murray* (US 2003/0171206), as applied to claim 1 above, and further in view of *Babb et al.* (US 6,627,573).

Murray anticipates claim 12, as noted, but fails to teach the metallocene catalyst defined in the instant claim 21.

Babb et al. teaches a titanium(II) metal coordination catalyst complex, such as the catalyst defined in claims 19, 20 and 22 (col. 15, l. 38 – col. 16, l. 8, and . *Babb et al.* further teaches that the above complex can be used advantageously in the copolymerization of olefins in the gas phase, especially the copolymerization of ethylene with higher alpha olefins (col. 22, ll. 14-18). They can also be used in the manufacturing of linear low density polyethylene (LLDPE) (col. 22, ll. 20-24). Further the gas phase polymerization can be carried out in a fluidized bed reaction zone, which also employs the condensed mode (col. 22, ll. 64-67) and also in a continuous process (col. 23, ll. 9-10).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a titanium (II) catalyst complex as suggested by *Babb et al.* in the polymerization process of *Murray et al.* because it is preferably used to polymerize ethylene and higher alpha olefins.

8. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Murray* (US 2003/0171206), as applied to claim 12 above, in view of *Devore et al.* (US 5,470,993) and further in view of *Babb et al.* (US 6,627,573).

Murray anticipates claim 12, as noted, but fails to teach the metallocene catalyst defined in the instant claim 21.

Devore et al. discloses titanium or zirconium catalyst complexes in the +2 oxidation state as defined in claim 21 of the instant invention (col. 6, ll. 16-50). *Devore et al.* further teaches that the catalyst complexes can be used in a gas phase polymerization process and can be used to polymerize addition polymerizable monomers (col. 3, ll. 46-54). Further, the complexes catalyze with great efficiency at high temperatures (col. 3, ll. 62-63). The diene group is able to undergo chemical reactions or replacement by another ligand (col. 4, ll. 30-33). *Devore et al.* further teaches that the catalysts can be used in reaction environments with temperatures from 0 to 250°C and pressures of 0.1 to 100 MPa (col. 19, ll. 11-15).

Babb et al. also discloses the same catalyst compounds as *Devore et al.* *Babb et al.* further teaches that the above complexes can be used advantageously in the copolymerization of olefins in the gas phase, especially the copolymerization of ethylene with higher alpha olefins (col. 22, ll. 14-18). They can also be used in the manufacturing of linear low density polyethylene (LLDPE) (col. 22, ll. 20-24). Further the gas phase polymerization can be carried

out in a fluidized bed reaction zone, which also employs the condensed mode (col. 22, ll. 64-67) and also in a continuous process (col. 23, ll. 9-10).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a titanium (II) catalyst complex with a pi-bonded group as suggested by *Devore et al.* and *Babb et al.* in the polymerization process of *Murray et al.* because it is stable at high temperatures and is preferably used to polymerize ethylene and higher alpha olefins.

Response to Arguments

9. Applicant's arguments filed January 11, 2010 have been fully considered but they are not persuasive.

a. Applicants argue the combination of *Murray* in view of *Jenkins*.

The examiner agrees that *Murray* does not disclose operation in condensed mode; however, *Murray* does disclose a recycle stream, specifically pointing to (and incorporating by reference) the *Jenkins* references to provide examples of this recycle stream. *Jenkins* teaches the method of operation in condensed mode, which is only relevant to the recycle stream, as indicated in the instant specification, that of which also points to *Jenkins* (US 4,588,790) as an example of condensed mode operation (see instant specification, p. 2, ll. 26-33).

Murray meets all of the limitations of the gas phase polymerization claimed in instant claim 12 when combined with *Jenkins* to ONLY teach the method of operating in condensed mode. *Murray* does teach the reaction as

being only in the gas phase, such that the phase in the reactor is that of gas; however, this has nothing to do with the recycle stream, which as taught by *Jenkins* contains both gaseous and liquid phases. The physical states of the monomers in the reactor are completely separate from that of the recycle stream.

Further, the combination of *Murray* in view of *Jenkins* is CLEARLY *prima facie* obvious as *Murray* explicitly refers to *Jenkins* to teach the method of using a recycle stream with the method of polymerization as taught by *Murray*.

b. Applicants argue *Murray* fails to teach the claimed ranges of instant claims 15 and 17.

Murray teaches the comonomers to have "from 3-15 carbon atoms, preferably from 4-12 carbon atoms, and most preferably from 4-8 carbon atoms" (p. 10, [0117]), further teaching “the mole ratio of comonomer to ethylene, Cx/C2...is between about 0.001 to 0.200 and more preferably between about 0.002 to 0.008” (p. 10, [0119]).

Although *Murray* fails to teach the ratio with respect to one particular monomer, the ratio is taught in general to a range of possible monomers. *Murray* clearly teaches the use of octane and decene and clearly teaches the claimed ratio of 0.0001 to 0.02, and clearly overlaps with the claimed range of 0.00005 to 0.005.

c. Applicants argue that "The action considers that *Jenkins* would have been inherently devoid of "substantial condensation" if operated as directed by *Murray*", arguing that this is "based on hindsight that if the process of *Jenkins* is operated at *some of the ratios* disclosed in *Murray* using *some of the disclosed* comonomers, the process must operate such that there will be no substantial condensation in the reactor".

The action clearly does not appear to suggest this. The action states that *Murray* fails to specifically teach that the amount of α-olefin is maintained below that at which substantial condensation in the reactor occurs; however, the amount of comonomer and temperature and partial pressures in the reaction zone are clearly taught by *Murray* and would have been obvious to one of ordinary skill in the art at the time the invention was made to have operated the polymerization in "condensed mode", as described above [in view of the teachings of *Jenkins*]. Therefore, the process **[or combination] of *Murray* in view of *Jenkins et al.* would have inherently been void of any "substantial condensation",** which is further supported by the applicants' disclosure that "the level of condensation in the reactor...is controlled by the amount of comonomer and the temperature and partial pressure in the reaction zone" (see arguments submitted May 26, 2009, page. 8).

The action makes this argument using the combination of *Murray* in view of *Jenkins*, neither *Murray* nor *Jenkins* alone. Further, *Murray* teaches the method of polymerization within the reactor, not *Jenkins*. The method of

polymerization is NOT being carried out by the process of *Jenkins* using the monomers of *Murray*. The polymerization IS being carried out by the process of *Murray* using the monomers and concentrations thereof taught by *Murray*. *Jenkins* is ONLY used to teach the method of condensed mode, which as stated above, ONLY relates to the recycle stream, NOT the properties within the reactor.

Further note, applicants disclose in the instant specification that the condensation referred to in the claims is that which occurs “in the reaction zone” (see p. 3, ll. 10-15), which is NOT the recycle stream.

Note: The reference to “substantial condensation” in the above rejections and responses to applicants arguments can be substituted for applicants new claim limitation of the process being carried out “wherein the partial pressure of said alpha-olefin in the reaction zone is maintained below and amount which would, at a temperature of 10ºC less than the temperature of the monomer mixture in the reaction zone, be the saturated vapor pressure of said alpha-olefin to prevent condensation of said alpha olefin in the reaction zone".

This claim limitation is inherently present in the process of *Murray* in view of *Jenkins*, as similarly described for ”substantial condensation”. The examiner has clearly presented a case for inherency that the amount of condensation within the reactor of *Murray* in view of *Jenkins* is inherently the same as that of the instant invention, as the reaction conditions are the same. The burden now shifts to the applicant to show that the method of polymerization of *Murray*

operating in condensed mode, as taught by *Jenkins*, does not result in the claimed condensation.

d. Applicants agree that *Muhle* Teaches the desire to minimize the concentration the α-olefin, which results in the ability to permit for higher levels of condensed liquid to be employed in the condensed mode permitting for higher production rates. Although *Muhle* fails to make a specific suggestion towards the higher α-olefins, basic knowledge of chemistry can be used to relate the teaching of *Muhle* to any α-olefin described by *Muhle* (col. 12, ll. 55-64), as described above.

Note: This rejection is not required to reject instant claim 17, as the method of *Murray* in view of *Jenkins* (without the teaching of *Muhle*) clearly teaches a mole ratio of comonomer to ethylene overlaps with the claimed range.

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brieann R. Fink whose telephone number is (571)270-7344. The examiner can normally be reached on Monday through Friday, 7:00 AM to 4:30 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton I. Cano can be reached on (571)272-1398. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Milton I. Cano/
Supervisory Patent Examiner, Art Unit 1796

/Brieann R Fink/
Examiner, Art Unit 1796